

Major Insect-Pests of Storage and Their Management

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Introduction

Nearly 1000 species of insects have been found associated with the stored grains in the world. In India 12 species of them are most important which caused post-harvest losses. They belong to the orders, Coleopteran & Lepidoptera. About 10% of stored grains is lost due to pests including insects, rats, birds, mites, micro-organisms, moisture etc. The major economic loss caused by grain infesting insects is not always the actual material they consume, but also the amount contaminated by them and their excreta which make food unfit for human consumption. IPM module of storage insect pest along with safer insecticide with recommended dose should be used. To manage stored-pest by using multiple, compatible technique under IPM pest populations should be reduced to levels below those causing economic impact. These tactics viz. physical, mechanical, behavioral and chemical should be used for management of stored grain insect- pests.

Primary Storage Pests

Khapra beetle: *Trogoderma granarium*

Host range: Wheat, maize, jowar, rice, pulses, oil seeds and their cakes.

Identification of the pest: Eggs are laid on the grains or crevices. Grub is straw coloured with dark brown hairy bands on each segment and typical posterior tuft forming a tail of long hairs. It is active, move and feed freely. Pupation takes place on the surface of the grain in bulk and overlapping edges of bags. Adults are reddish brown, convex, oval in shape with practically no distinct division of head, thorax and abdomen. Abdomen size is comparatively larger.

Symptoms of damage: Adults are harmless. Grub damages the grain starting with germ portion, surface scratching and devouring the grain. It reduces the grain into frass. Excessive moulting results in loss of market value due to insanitation caused by



the cast skin, frass and hair. Crowding of larvae leads to unhygienic conditions in warehouses. Damage is confined to peripheral layers of bags in bulk storage.

Rice weevil: *Sitophilus oryzae*, *S. zeamais*, *S. granaries*

Identification of the pest: Eggs are translucent white, plugs the egg hole with gelatinous secretion, laid singly on grains. Grub white with yellowish brown head, apodous, fleshy, curved, remains within the grain. Pupates inside the grain. Adults Small, reddish brown to chocolate coloured weevils has characteristic snout, and the elytra have four yellow spot.

Symptoms of damage: Both grub and adults cause the damage. Grains are hollowed out; kernels are reduced to mere powder. *S. oryzae* and *S. zeamais* starts its attack in field itself. Adults cut circular holes. Heating takes place during heavy infestation, which is known as 'dry heating'.

Pulse beetle: *Callosobruchus chinensis*, *C. maculatus*

Host range: All whole pulses, beans and grams.

Identification of the pest: Egg laid singly, glued to the surface of the pod (in fields) or on grains (in stores). Grub fleshy, curved, creamy white in colour with black mouth parts. Pupation takes place in a pupal cell prepared beneath the seed coat. Brownish grey beetle with characteristic elevated ivory like spots near the middle of the dorsal side. It is small, short, and active with long conspicuous serrate antenna.

Symptoms of damage: Grubs eat up the grain kernel and make a cavity. Adults come out making exit holes.

Lesser grain borer/Hooded grain bore r/paddy borer beetle: *Rhyzopertha dominica*

Host range: Paddy, rice, wheat, maize.

Identification of the pest: Eggs are laid on the surface or on the interstices of cereal grains singly or in clusters. Grub white, apodous with brown head, free living upto 3rd instar. Grub enters the grain after 3rd instar for pupation. Adult brown to blackish beetle, head is deflexed down wards below prothorax to such an extent that it is almost hidden in a dorsal view.

Symptoms of damage: Grubs and adults cause damage and are voracious feeders. Adults reduce the grain kernels to mere frass. Grubs eat their



way into the grain or feed on the grain dust and are capable of attacking grain externally.

Angoumois grain moth or Grain moth: *Sitotroga cerealella*

Host range: Paddy, maize, jowar, barley and wheat (rarely).

Identification of the pest: White eggs laid on the surface of damp grains in stores or fields, which soon become red. Larva white with yellow head. Pupates in cocoon inside the grain. Adult dirty yellowish brown with narrow pointed wings completely folded over back in a sloping manner.

Symptoms of damage: Larvae damage grains, adults being harmless. Grains are hollowed out. It attacks both in fields and stores. In stored bulk grain, infestation remains confined to upper 30 cms depth only.

Sweet Potato weevil: *Cylas formicarius*

Host range: Sweet Potato: Potato

Identification of the pest: Egg laid in cavities on vines or tubers. Pupate inside vine or tuber inside tuber. Adult slender, ant like with long snout, shiny black with reddish brown thorax and leg.

Symptoms of damage: Grubs and adults bore into tubers, field and storage. Adult weevils feed on vines, leaves.

Potato tuber moth: *Pthorimaea operculella*

Host range: Potato

Identification of the pest: Egg laid singly on under surface of leaves and exposed tubers. Larvae pale greenish. Pupa silken cocoon among trash or ground or bags. Adult small dark brown moth with fringed wings; forewings grey brown with dark spots and hind wings dirty white.

Symptoms of damage: Larvae mine into leaves or bore into tender shoots and developing tubers. Rotting and foul smelling of damaged tubers.

Cigarette beetle: *Lasioderma sericorne*

Host range: Wheat flour, cereal bran, peanuts, cottonseed, spices and even insecticides containing pyrethrum, meat and fishmeal, ginger, turmeric and chillies.

Identification of the pest: Grub are white, fleshy and hairy grub. Adult are small, robust, oval, light brown round beetle with its thorax and head bent downward gives



the insect a humped appearance. Elytra have minute hairs on them and are not striated.

Symptoms of damage: Grub causes the damage which made circular, pinhead sized bore holes on processed tobacco.

Secondary Storage Pests

Rust red flour beetle: *Tribolium castaneum*

Confused flour beetle: *Tribolium confusum*

Host range: Broken grains/ mechanically damaged grains, germ portion and milled products. Heavy infestation causes stinking odour in flour, adversely affecting the dough quality. It is an important pest for mill machinery.

Identification of the pest: Egg are white, translucent, sticky, slender and cylindrical. Grub worm like, whitish cream colour, faint stripes, two spines like appendages at the end segment. Pupa remains loosely lying in the grain and is naked. Adult oblong, flat, brown in colour.

Symptoms of damage: Grubs feed on milled products. Flour beetles are secondary pests of all grains and primary pests of flour and other milled products. In grains, embryo or germ portion is preferred. They release gaseous quinines to the medium, which may produce a readily identifiable acid odour in heavy infestations.

Long headed flour beetle: *Latheticus oryzae*

Host range: Cereal flours, packaged food, rice and rice products, grains with excessive dust, dockage and broken grains with high moisture contents preferred.

Identification of the pest: Eggs are white, smooth, cylindrical eggs at random in grain and seams of the bags. Grub active grub feeds voraciously. Pupa is naked. Adult light brown with elongated body, resembles *Tribolium sp.*

Symptom of damage: Both grubs and adults feed.

Rice moth: *Corcyra cephalonica*

Host range: Rice, jowar, other millets, whole cereals, cereal products, pulses, processed products of cereals, pulses, oil seeds, nuts, dry fruits and milled spices.

Identification of the pest: Egg small, oval, elliptical laid on wall, bags or on grain. Larva creamy white has prothoracic shield. It webs silken shelter before pupation. In case of heavy infestation cocoons may be seen sticking to the grain bags. Cocoon



dense white and tough. Adult are pale buff brown colour, forewings pale yellowish green and grey white hind wings.

Symptoms of damage: Larva is only responsible for damage. It contaminates food grains with frass, moults and dense webbing. In whole grains, kernels are bound into lumps upto 2 kg.

Indian meal moth: *Plodia interpunctella*

Host range: Maize, cereals, dry fruits, groundnuts and cereal products.

Identification of the pest: Egg greyish white with granular surface, laid indiscriminately at night. Larva transparent, dirty white, skin is granular with hairy body. Pupa straw coloured, changes colour to greyish with age, in silken cocoon. Adult forewing basal half silver white or greyish, outer 2/3 portion is reddish copper bronze lustre with irregular bands.

Symptoms of damage: Larva causes serious damage to ear and grain of maize; contaminates the grain with excreta, cast skins, webbings, dead individuals and cocoons; prefers to eat the germ portion and hence grains lose viability. It feeds superficially but may construct more than one silken tunnel.

Saw toothed grain beetle: *Oryzaephilus surinamensis*

Host range: Rice, wheat, maize, cereal products, oil seeds and dry fruits.

Identification of the pest: Egg whitish eggs laid loosely in cracks of storage receptacles or godowns. Grub is slender, pale cream with two slightly darker patches on each segment. Pupa full grown grub makes protective cocoon like covering with sticky secretion. Adult narrow, flattened, thorax having six teeth like serrations on each side. Antenna clubbed. Elytra cover abdomen completely.

Nature of damage: Adults and grub cause roughening of grain surface and off odour in grain. Grains with higher percentage of broken, dockage and foreign matter sustain heavy infestation, which leads to heating of grain.

Management of stored grain pests

Preventive / prophylactic measures -

1. Threshing yards clean and away from stores.
2. Gunny bags new and insect free.
3. Grain dried to have less than 10% moisture, before filling in bags.

4. Transport carriers free of infestation.
5. Stores moisture free and rat proof.
6. Before storing, cracks and crevices on walls, floor closed.
7. Dirt, rubbish, sweepings removed and white washed.
8. Disinfestation of stores by treating walls, dunnage, ceilings of empty godown with malathion 50 EC 1: 100 or DDVP 100EC 1: 300 @ 3 litres / 100m²(DDVP is a constant and fumigant)
9. Maintenance of good storage conditions by providing dunnage, leaving gangway or alleyway of 0.75 – 1.0 mt all around for aeration, inspection and operations.
10. Stack spraying over the bags with malathion 50 EC 1: 100 @ 3 litres/ 100m². Do not spray directly on food grains

Curative measures

Most useful and practical curative method is fumigation and fumigants. Process of applying toxins in fumes or gases to infested grains for certain period in reasonably air tight chamber or room is called fumigation. Depending upon the need, fumigation may be

1. Shed fumigation
2. Cover fumigation
3. Fumigation in air tight containers

Choose the fumigant and work out the requirements based on the recommendation.

Aluminium phosphide:

- For cover fumigation or air tight containers - 3 tablets of 3g each/ tonnes of grain. In case of cover fumigation, mud plastering and sand snakes to be used for preventing leakage of toxic gas.
- For shed fumigation – 21 tablets each weighing 3g / 28 m³
- Period of fumigation – 5 days

Other fumigants earlier used are EDB, EDB + EDCT. MB are now banned and no longer permitted.

Other curative methods:

1. Mechanical methods

Light traps against *Ephestia*, *Lasioderma* for monitoring and mass trapping.

2. Use of centrifugal force: subjecting infested commodities at a speed of 2000-3000 rpm kills insects.
3. A device ENTOLETOR for milled products is effective.

Conclusion:

The losses due to insect activity during storage are physical loss, loss in carbohydrates and proteins, nutritional losses and contamination of product with uric acid, fragments and fecal matter. To avoid this losses, grains stored below 10⁰C temperature and used fumigants as given recommended dose.

